Next Generation Advanced Binder Chemistries for High Performance, Environmetally DurableThermal Control Material Systems., Phase I

Completed Technology Project (2004 - 2004)

Project Introduction

This innovative SBIR Phase I proposal will develop new binder systems through the systematic investigations to tailor required unique performance properties and reliability through tailoring Nano-cluster chemistry. The efforts address a critical need of NASA which plans to undertake challenging missions in high radiation orbits for high power thermal management. This feasibility evaluation mainly proposed to fulfill the material and the knowledge gap, and to present concepts for the new class of binder material chemistries that are dielectrically engineered with required secondary emission properties. The proposed efforts also for first time investigate possible proton quenching concepts that can help also in mitigating proton damage. Thus, this timely proposal can fulfill the need of the multifunctional binder that has an excellent thermal shock performance and potential to improve the affordability. The phase I efforts will generate needed data to suggest the processing success windows and the efforts to carry out further optimization of the binder material system during the phase II efforts.

Anticipated Benefits

Like NASA, the commercial industry is planning several satellites for the broad band communication activities. The FAA and NASA are also planning commercial space based radars for air traffic control. Such platform structures are expected to be, if not as large as space station freedom, but at least sizable - where the charge accumulation can be an over riding concerns. These planned candidate fleet designs of such integrated space systems may require putting assets in the mid-earth orbits (MEO) for over all optimization and minimization of mission costs. Such mission and fleet designs can be possible only if the material technologies are made available that have the proton resistance built into them for the required reliability. Currently no material technology exists that can mitigate proton induced degradation effects. Many other NASA planetary, the commercial and some of the DOD platform hardware will also benefit form these proposed binder systems. The dividend provided by the charge mitigation applications of binder chemistry by either dip coating or the rub priming of the binder systems can also have major appeal to Non-NASA applications. The suggested new generic binder systems can benefit the current state-of-the-art TCMS for thermal control applications to enhance their multi functionality and assist in high-power thermal management challenges with improved affordability. The use of such envisioned binders can enhance NASA?s ability to carry out space science missions in the orbits such as MEO; the planetary orbits and the several sun earth connection study mission orbits where the protons may be present as one of the main degrading species. The stable dielectrically tailored binder system can be a central requirement to any NASA space program. For Space Station Freedom the structure is grounded to the negative of the solar array and hence is about 140 volts below plasma potential. The discharge across the

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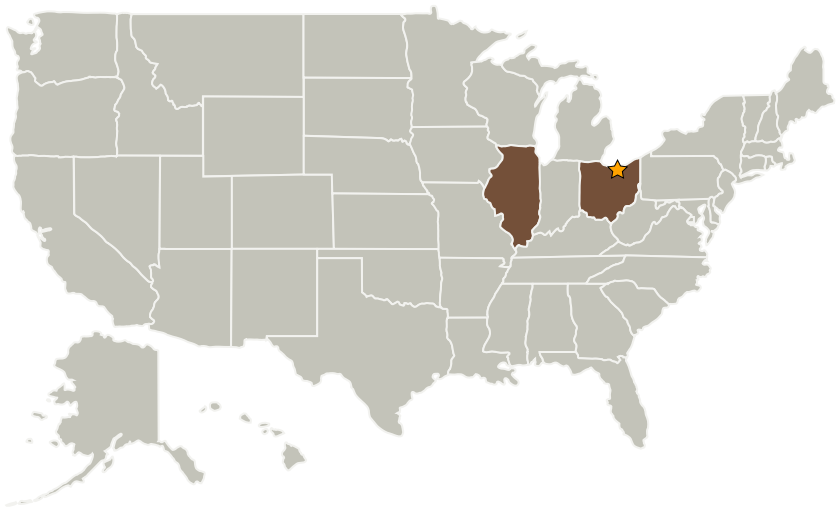
discontinuities caused by the micro-meteoroids can generate electromagnetic interference and even sputtering of the underlying metallic layer. The rub-primed binder that fills the micro-porosity resulted from the anodized aluminum at the surface can help with prevention of electromagnetic interference. This has potential to simplify the grounding schemes and minimize the costs associated with the same. Thus the envisioned binder system has multiple core abilities to impact the potential NASA applications.

Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Glenn Research Center(GRC)	Lead Organization	NASA Center	Cleveland, Ohio
Applied Material Systems Engineering, Inc. (AMSENG)	Supporting Organization	Industry Small Disadvantaged Business (SDB)	Schaumburg, Illinois

Primary U.S. Work Locations	
Illinois	Ohio

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Glenn Research Center (GRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Project Manager:

Joyce A Dever

Principal Investigator:

Mukund(mike) Deshpande

Technology Areas

Primary:

- TX05 Communications, Navigation, and Orbital Debris Tracking and Characterization Systems
  - TX05.3 Internetworking

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Technology Areas *(cont.)*

- TX05.3.4 Integrated Network Management